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(54) Reinforced ridged cover for ink cartridge and cartridge loading mechanism

(57) An air impermeable but soft polypropylene ink cartridge 1 has reinforcing ridges 6 projected from corner portions of peripheral walls 2,3 and a thick-walled opening end edge 4. A cover 20 is sealed to the cartridge by welding and has longitudinal ridges 21 formed on an inner surface thereof, and shape retaining ridges (23,Fig.3(a)) which project integrally from an outer surface of the ridges 21 so as to engage the body walls, so that deformation of the cartridge is suppressed during welding - any burrs thus formed are collected in a groove 25 of the cover. A cartridge (120,Fig. 12(a)-(d)) may be loaded onto a carriage without breaking an ink supply needle (119) by engaging a recess 15 in the lower surface of the cartridge with a support rod (117) of a lifter (115), and closing a pivotable carriage cover body (110) while guiding the lifter with a guide groove (106) parallel to the axial centre of the needle.

FIG. 1

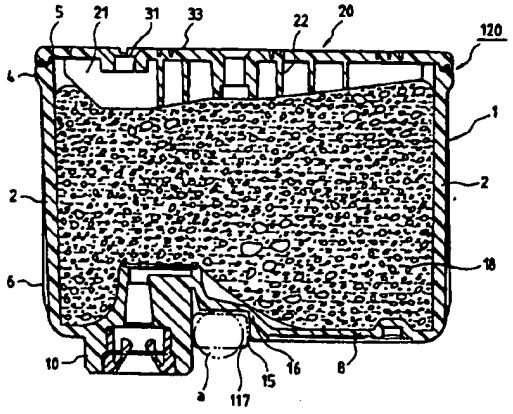
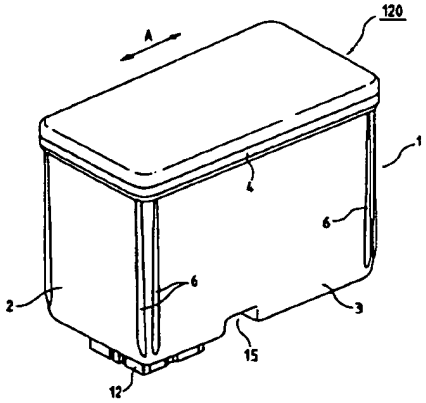


FIG. 6



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

FIG. 1

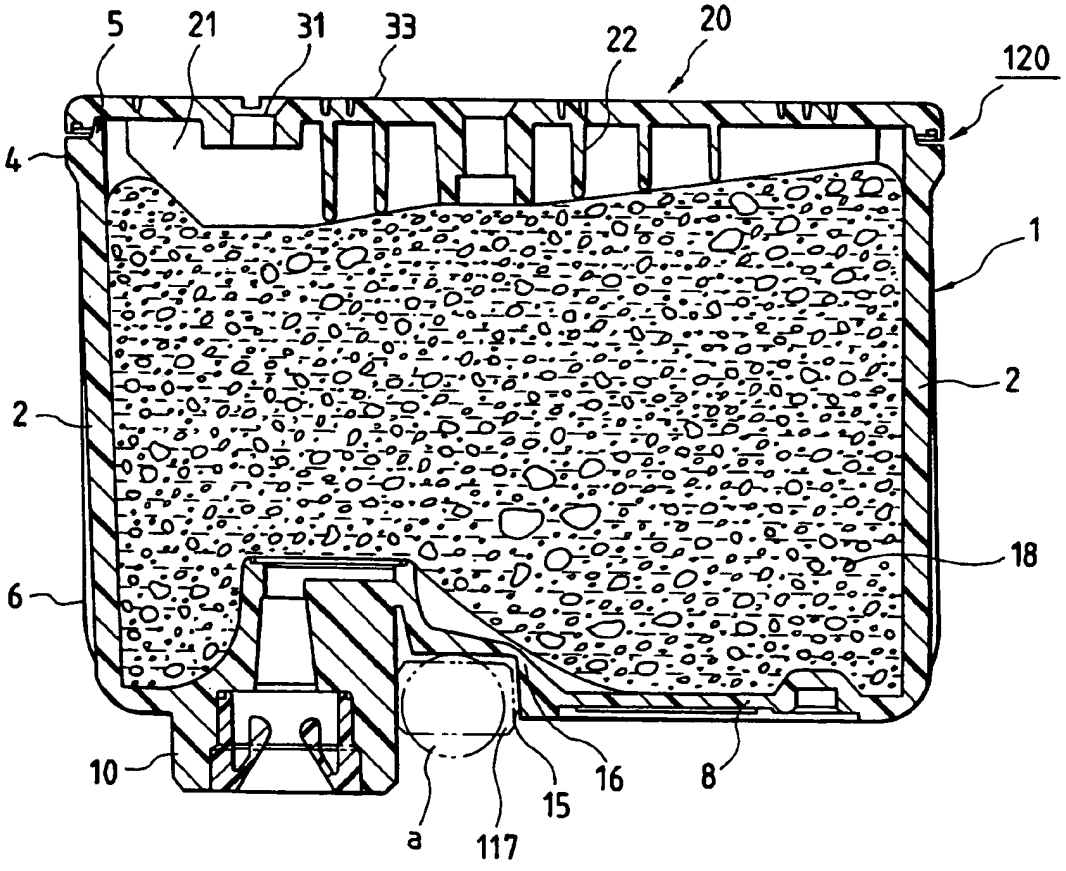


FIG. 2(a)

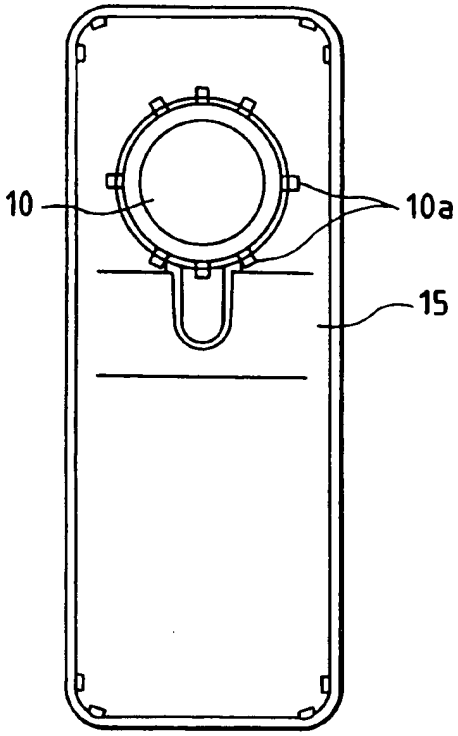


FIG. 2(b)

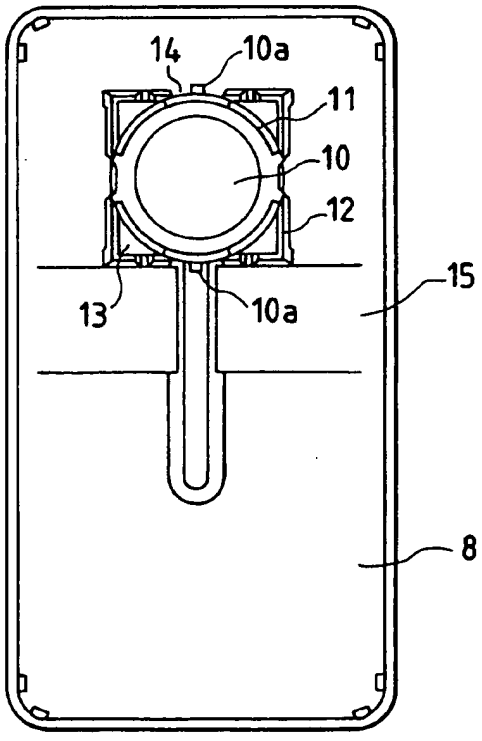


FIG. 3(a)

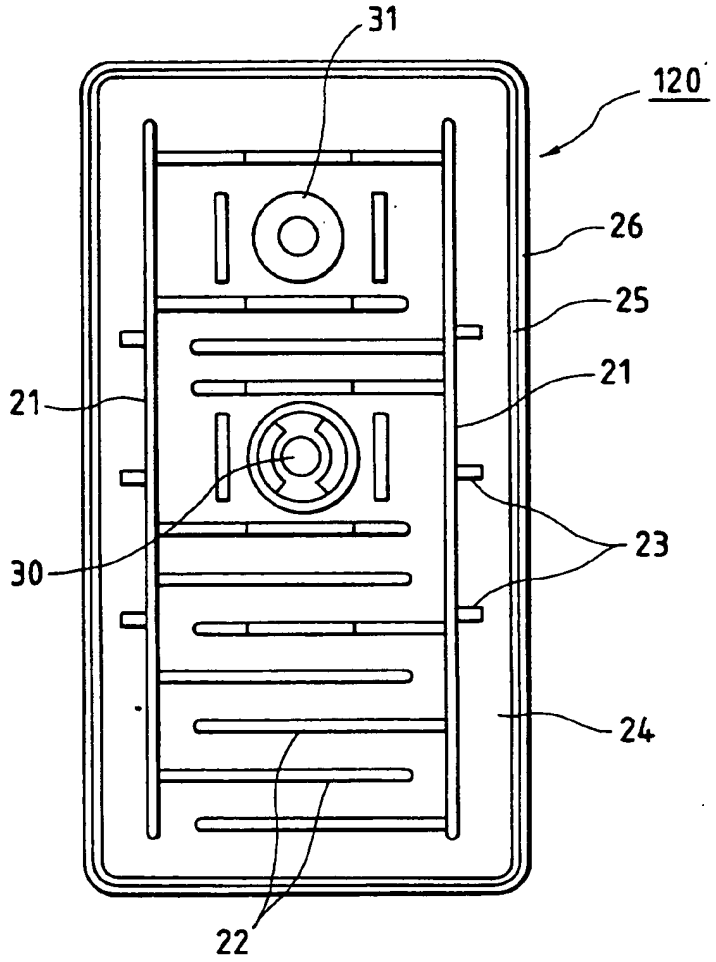


FIG. 3(b)

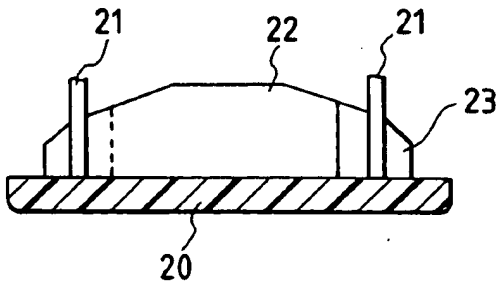


FIG. 4

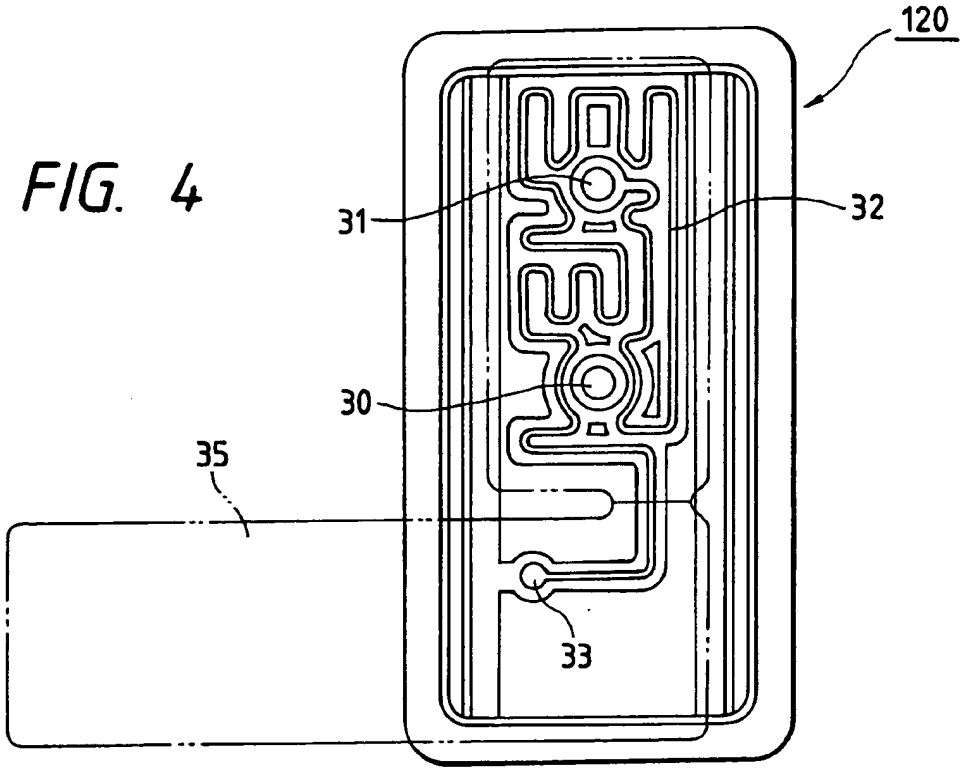


FIG. 5

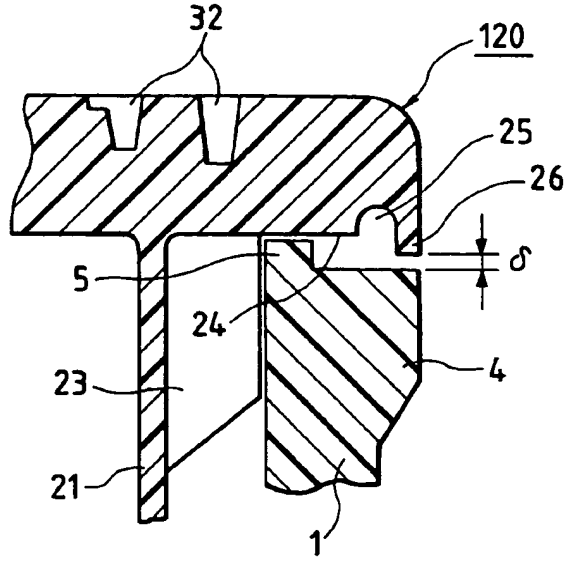


FIG. 6

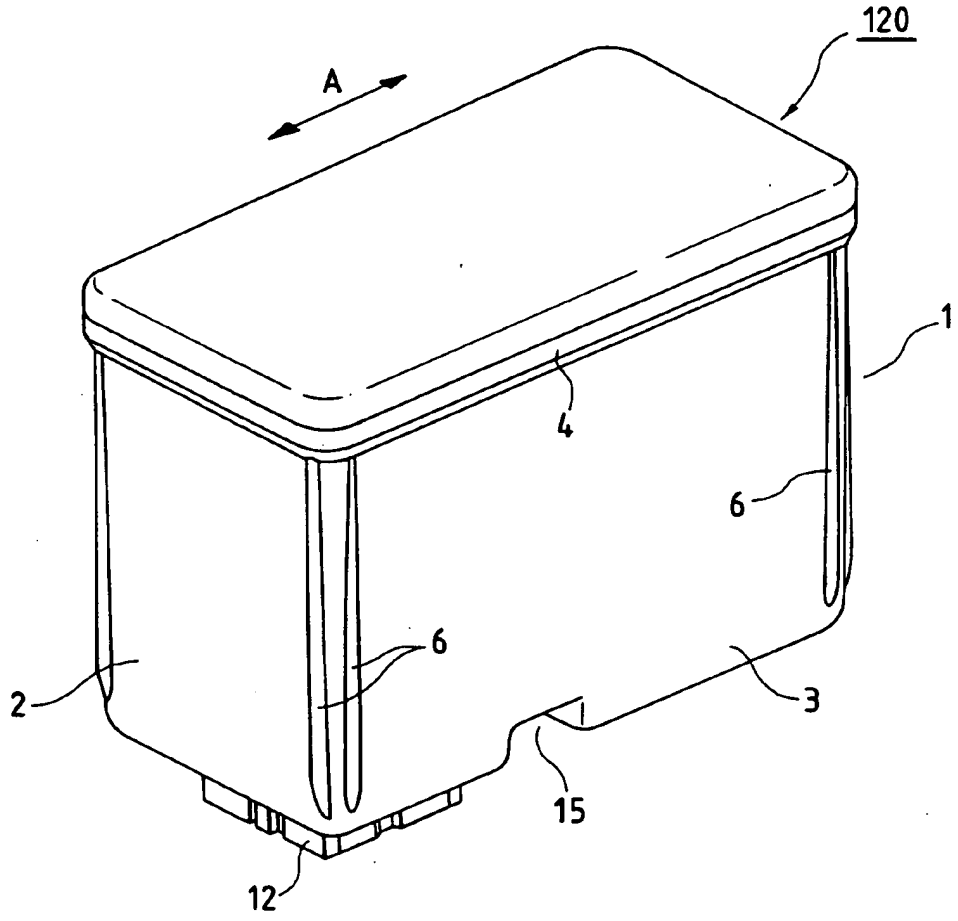


FIG. 7

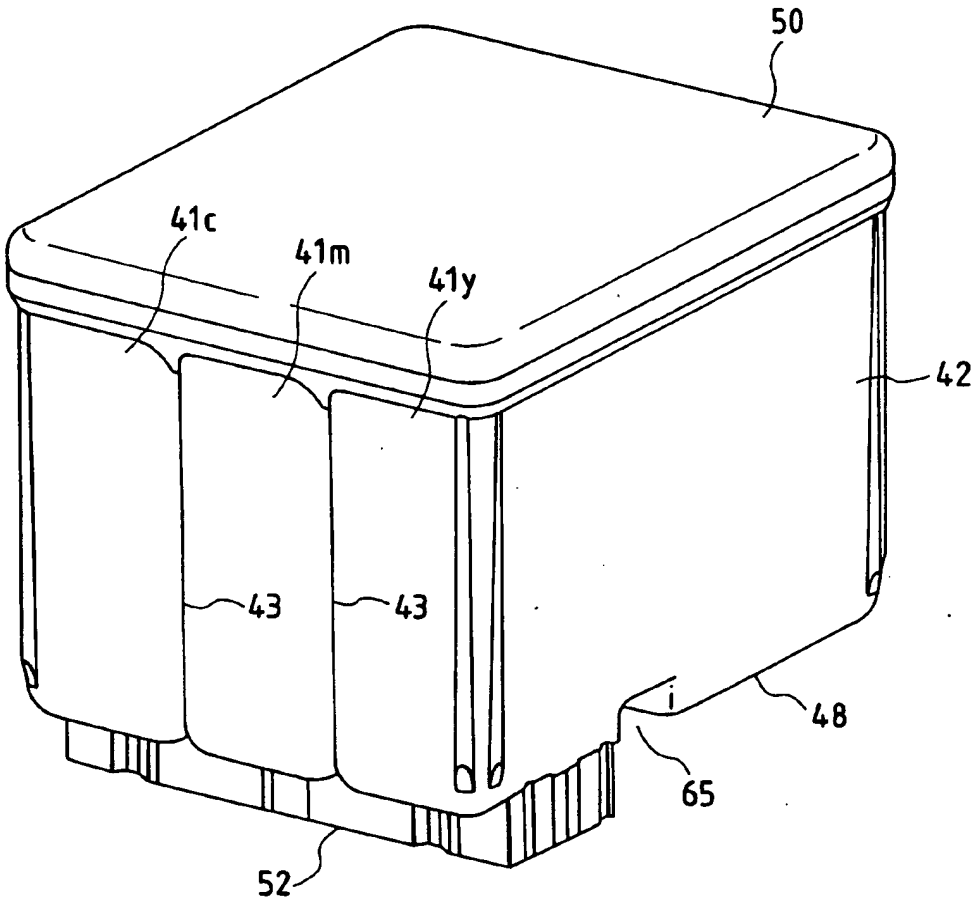


FIG. 8

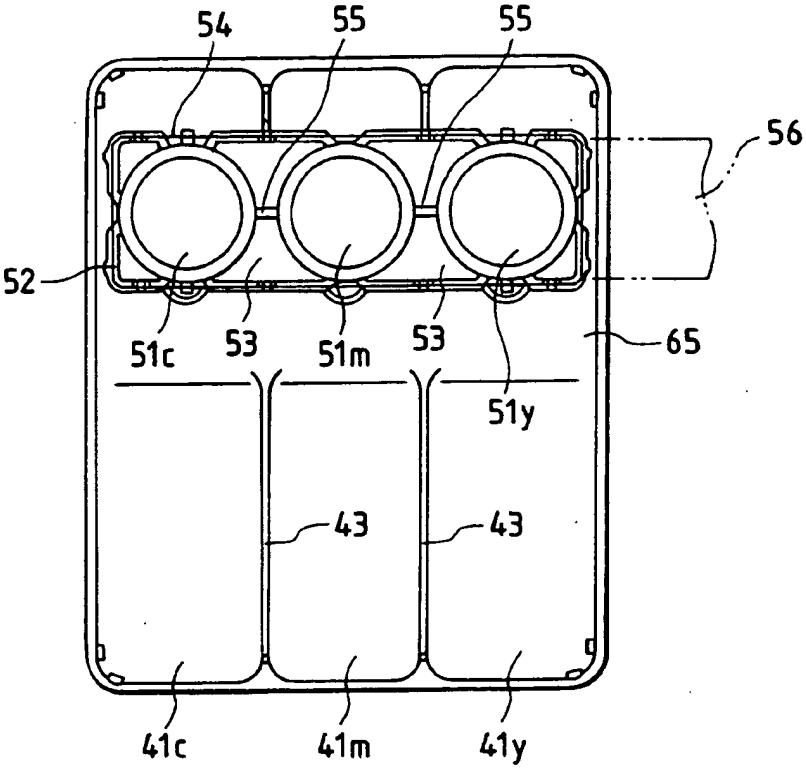

54
55
55
56
52
51c
53
51m
53
65
51y
43
43
41c
41m
41y

FIG. 10

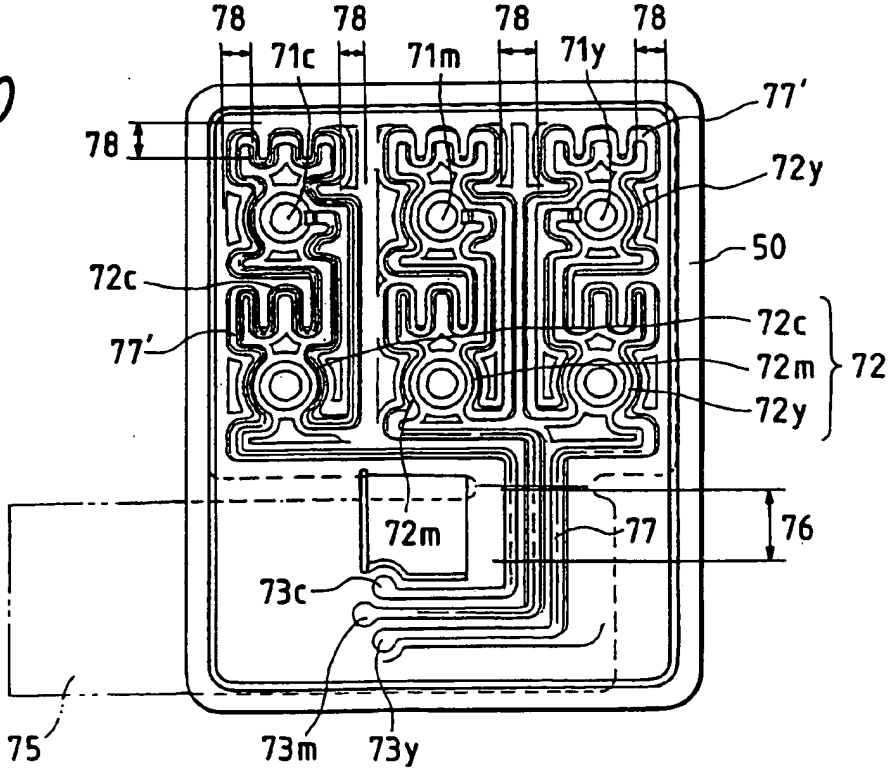

78
78
78
78
71c
71m
71y
77'
78
72y
50
72c
77'
72c
72m
72
72y
72m
77
76
73c
75
73m
73y

FIG. 9(a)

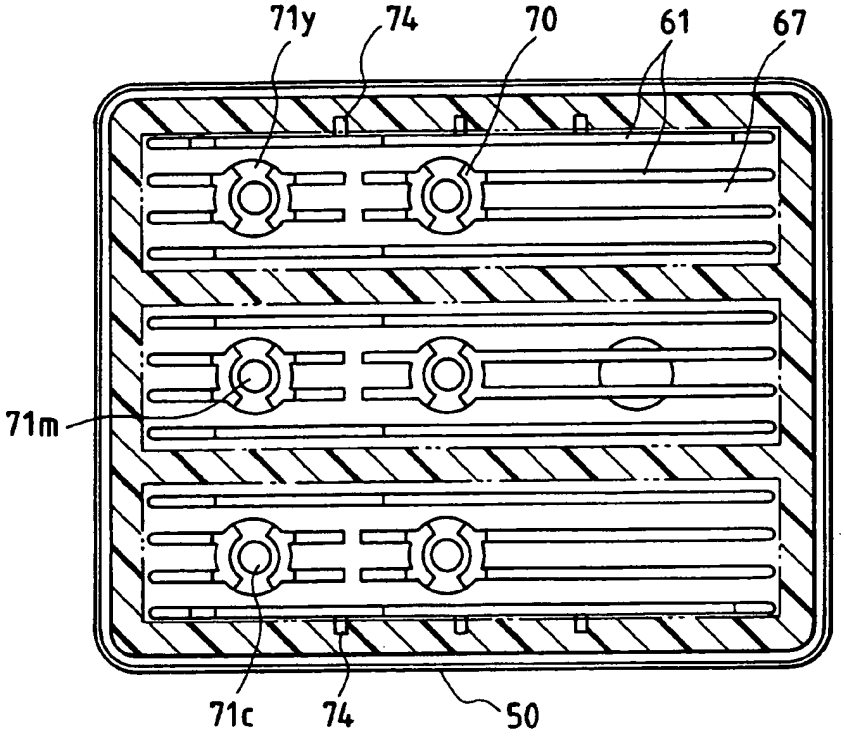


FIG. 9(b)

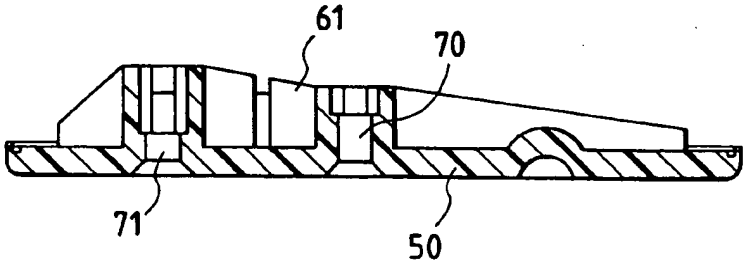


FIG. 11

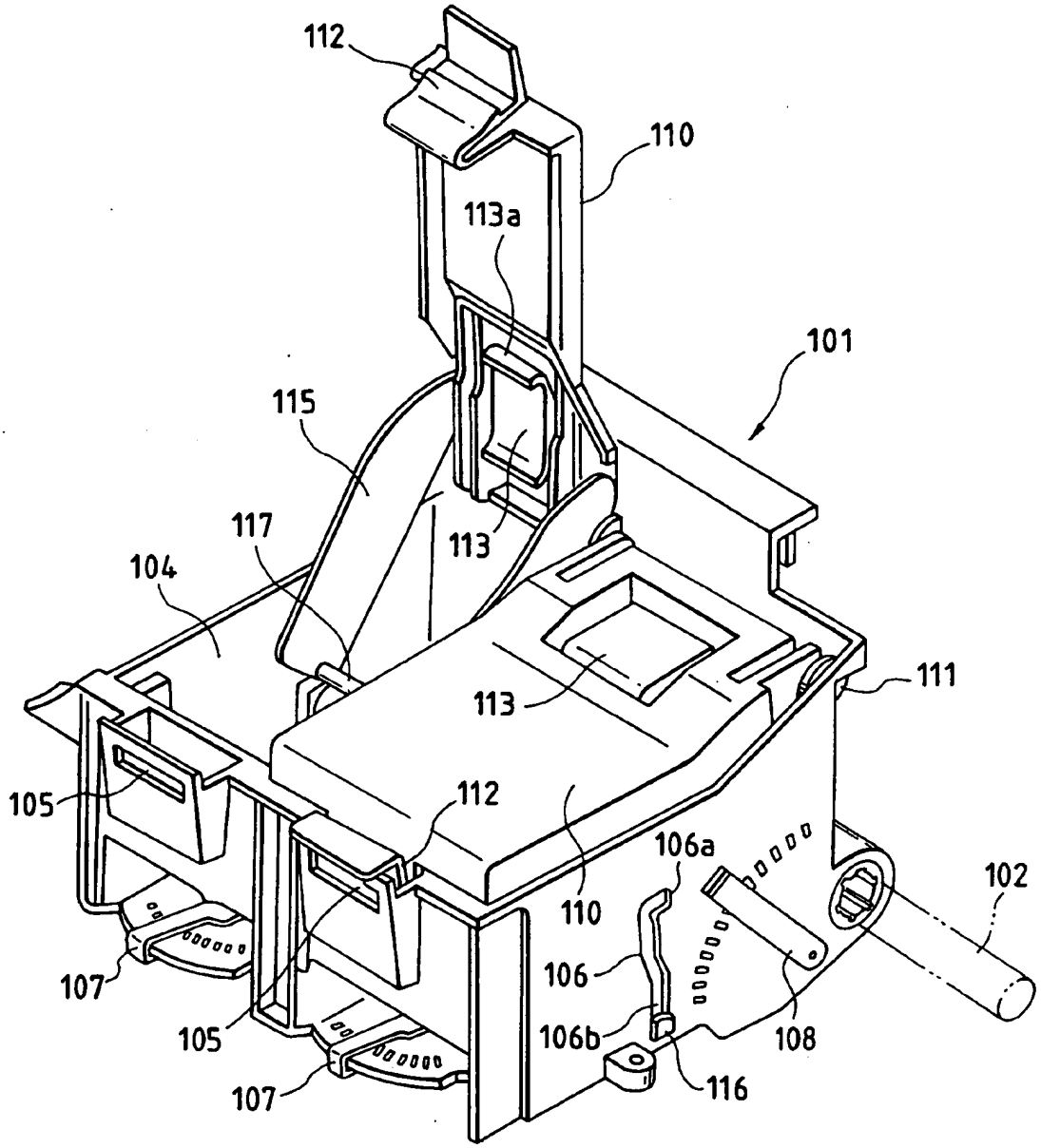

112
110
113a
101
115
117
113
104
111
113
105
112
106a
102
110
106
107
108
105
106b
116
107

FIG. 12(a)

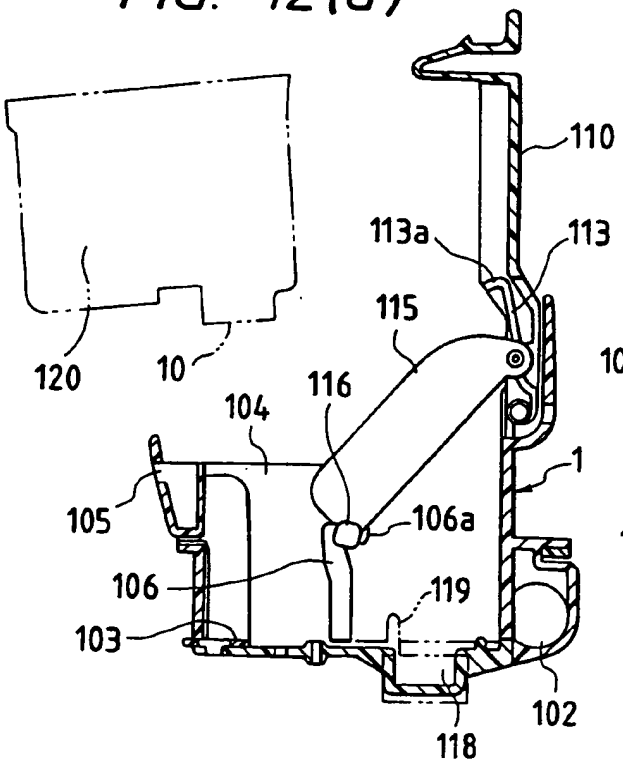


FIG. 12(c)

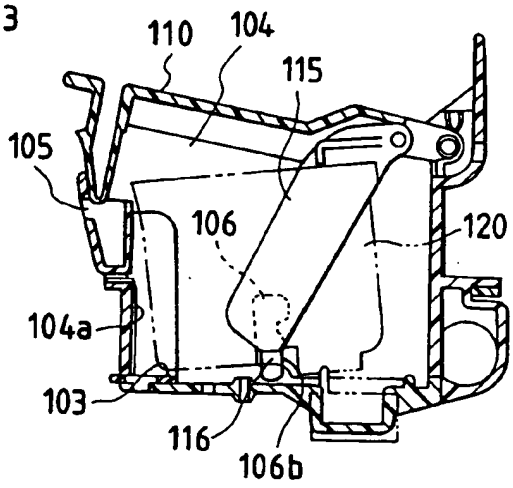


FIG. 12(b)

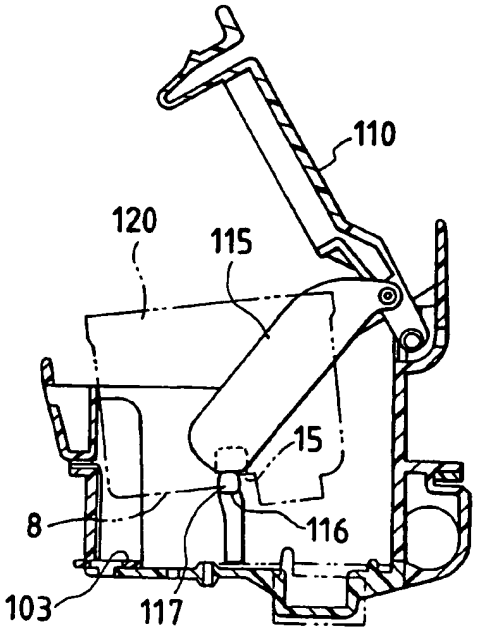


FIG. 12(d)

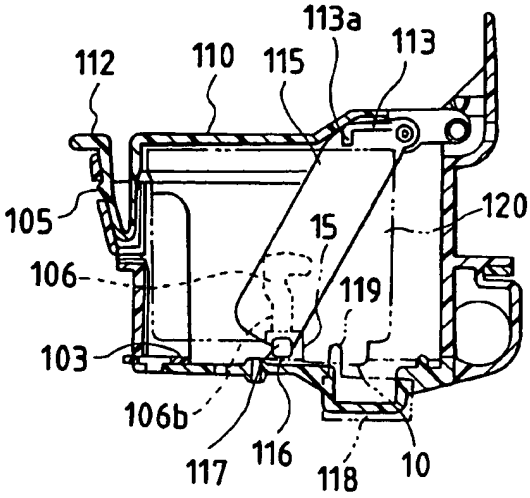


FIG. 13

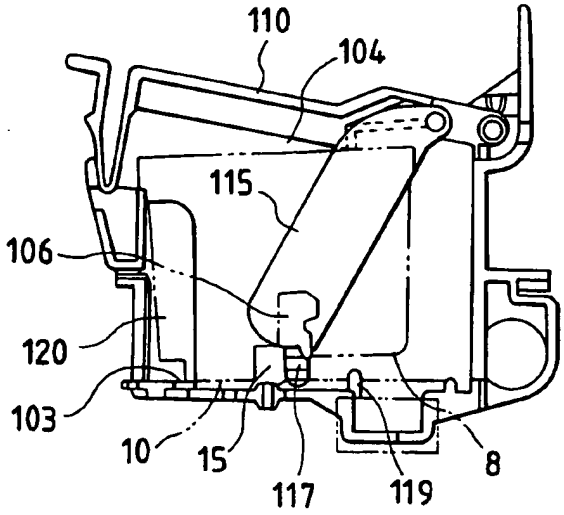
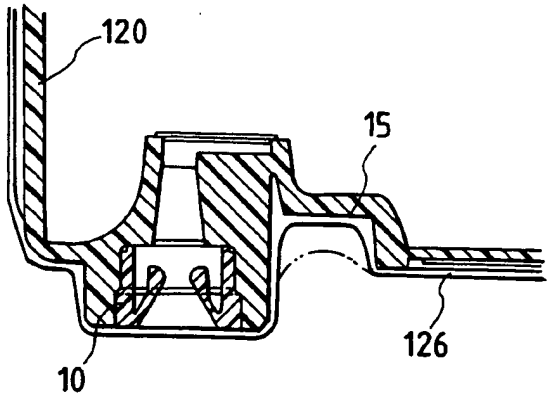


FIG. 14



INK CARTRIDGE AND LOADING MECHANISM FOR THE INK CARTRIDGE

The present invention relates to an ink cartridge used for an ink jet printer and a loading mechanism for such an ink cartridge.

Printers designed to make a recording using a liquid ink, particularly ink jet printers, use an ink cartridge such as disclosed by the present applicant in Japanese Patent Publications Nos. Hei. 5-270001 and Hei. 7-125238.

An ink cartridge of this type is usually formed of polystyrene having an appropriate degree of shape keeping property, and an ink is charged into such ink cartridge under reduced pressure. Since polystyrene is easy to permeate water vapour, if the ink cartridge has been in storage for a long period of time, the viscosity of the ink is increased due to evaporation of moisture, which in turn imposes the problem of defective jetting of ink droplets out of nozzles and hence impairs reliability. In addition, if an ink whose surface tension is low is used to allow ink droplets to be jetted out of tiny nozzles, bubbles are produced during ink charging operation under reduced pressure and film bonding operation, which in turn causes inconvenience that the ink spouts out of the ink cartridge.

By the way, an ink cartridge used for serial type ink jet printers requires that an ink supply needle projecting from the back of a recording head be correctly aligned with an ink supply port independently of its loadability to a carriage.

To achieve such object, a loading mechanism for loading an ink cartridge to a carriage proposed in Japanese Utility Model Publication No. Hei. 7-32049 is characterised as pushing an engaging projection toward the recording head while engaging the engaging projection with an engaging groove formed in a side surface of the ink cartridge by turning a lever, the engaging projection projecting from an inner side surface of the lever.

However, such loading mechanism produces the following inconvenience. That

is, since the engaging projection turns about the pivot together with the lever, a component force directed at right angles to the recording head is applied to the ink cartridge due to friction with the engaging projection. As a result, such component force is likely to break the supply needle projecting from the back of the recording head.

The present invention has been made in view of these problems. An object of the present invention is, therefore, to provide a novel ink cartridge having a sufficient rigidity even if a soft synthetic resin such as polypropylene that is hard to permeate water vapour but has poor shape keeping property is used.

Another object of the present invention is to provide a novel ink cartridge that does not cause ink to spout by bubbles produced during ink charging operation and the like.

Further, still another object of the present invention is, therefore, to provide a novel ink cartridge and a loading mechanism for such novel ink cartridge that can load and unload the ink cartridge correctly in parallel to the axial centre of an ink supply needle.

According to a first aspect of the invention, there is provided an ink cartridge comprising: an ink cartridge main body being moulded using a soft synthetic resin material, and having a reinforcing and positioning ridge being formed so as to project from a corner portion of a peripheral wall of said ink cartridge main body, an opening end edge of said ink cartridge main body being thick-walled; and a cover body covering an opening of said ink cartridge main body, and said cover body including: a charged foam pressing ridge being formed so as to project from an inner surface of said cover body in a longitudinal direction and to press a foam charged in said ink cartridge main body; and a shape keeping ridge coming in contact with an inner side surface of said opening end edge of said ink cartridge main body and being formed on an outer side of said charged foam pressing ridge, said charged foam pressing ridge being formed integrally with said shape keeping ridge.

According to a second aspect of the invention, there is provided an ink cartridge comprising a recess to be coupled with part of a lifter member, said recess and an ink supply port being formed in a lower surface of an ink cartridge main body.

Further, according to a third aspect of the invention there is provided a loading mechanism for an ink cartridge comprising: a cartridge loading member having an ink supply needle communicating with a recording head and projected toward an inner depth thereof; a guide portion on one side of an inner surface of said cartridge loading member, said guide portion extending in parallel to an axial centre of the ink supply needle; a cover body being turnably attached to an opening of said cartridge loading member; a lifter member being supported by a cover body, the lifter member being displaceable with a free end thereof guided by said guide portion, said cover body being turnably attached to an opening of said cartridge loading member; and a support rod on a free end portion of said lifter member, said support rod supporting the ink cartridge while being engaged with a recess formed in a lower surface of the ink cartridge.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying diagrammatic figures, in which:

Fig. 1 is a sectional view of an ink cartridge, which is an embodiment of the present invention;

Figs. 2 (a) and 2 (b) are bottom views respectively showing embodiments of the cartridge;

Figs. 3 (a) and 3 (b) are diagrams respectively showing an inner surface and a cross section of a cover body of the cartridge;

Fig. 4 is a top view of the cover body;

Fig. 5 is an enlarged sectional view showing a main portion of the cartridge and the cover body;

Fig. 6 is a perspective view showing the overall appearance of the cartridge;

Fig. 7 is a perspective view showing an ink cartridge for a colour printer, which

is another embodiment at the present invention;

Fig. 8 is a bottom view of the cartridge;

Figs. 9 (a) and 9 (b) are diagrams respectively showing an inner surface and a cross section of a cover body of the cartridge;

Fig. 10 is a top view at the cover body;

Fig. 11 is perspective view of a carriage having a cartridge loading mechanism, which is an embodiment of the present invention;

Figs. 12 (a) to 12 (d) are illustrations of a cartridge loading operation in sequence;

Fig. 13 is a diagram showing a condition in which a cartridge is loaded with surfaces of the cartridge facing in wrong directions; and

Fig. 14 is a diagram showing part at the cartridge in a packaged condition.

Embodiments of the present invention will now be described.

Figs. 1 to 6 show an embodiment of the present invention.

In Figs. 1 to 6, reference numeral 1 denotes an ink cartridge main body, which is made of polypropylene and which is substantially a rectangular solid in structure of an ink cartridge 120. Both end walls 2, 2 in the lengthwise direction of the peripheral walls of the main body 1 are made thicker than the side walls 3 in the widthwise direction, and an opening edge 4 on top is also made thick so as to be protruded outward. As a result of this construction, the ink cartridge main body 1 is given a sufficient rigidity. In addition, ridges 6 .. .. are integrally formed so as to project from the corner portions of the end walls 2 and the side walls 3. These ridges 6 .. .. serve not only to position the ink cartridge main body 1 with respect to a not shown cartridge holder but also to keep the shape of the ink cartridge main body 1 itself.

On the other hand, an ink supply port 10 having such a cylindrical shape as shown in Fig. 2 (a) is formed on one side of the bottom surface 8 of the ink cartridge main body 1 so as to project from the bottom surface. This embodiment is particularly characterised in that the ink supply port 10 is formed so as to project from the bottom

surface in such a manner that the cylindrical portion 11 on the inner side is enclosed by a square cylindrical portion 12 on the outer side as shown in Fig. 2 (b). As a result of this construction, not only the corner portions of a film are no longer cut with a press or the like at the time of sealing the ink supply port 10, but also gaps 13 between the cylindrical portion 11 and the square cylindrical portion 12 are taken advantage of as an air release portion at the time of bonding the film. Further, by arranging several notched portions 14 on the top edges of the square cylindrical portion 12, such notched portions are taken advantage of as an air release portion for releasing air inside at the time of bonding the film.

In this ink supply port 10, several long positioning ridges 10a or grooves are integrally formed on an outer peripheral surface so as to extend in a cartridge setting direction so that the ink supply port 10 can be used for a plurality of types of printers, and by bringing some of the ridges 10a or grooves into contact with the corresponding contact surfaces of the recording head, the axial centre of the ink supply port 10 can be aligned with respect to the ink supply needle correctly.

An engaging recess 15 extending across the width of the ink cartridge main body 1 is formed in the bottom surface 8 of the ink cartridge main body 1 in such a manner that the engaging recess 15 is located adjacent to the ink supply port 10. By engaging the recess 15 with a support rod a of a lifter disposed on the cartridge holder, erroneous attachment of the ink cartridge main body to the cartridge holder can be prevented. Further, an inwardly projecting stepped portion 16 which does not come in contact with a foam 18 charged in the ink cartridge main body 1, is formed backward of the recess 15, so that the amount of ink not absorbed by the foam is reduced, As a result, the inwardly projecting stepped portion 16 not only allows the ink to be used to the last drop, but also allows a space to be provided for evacuating the ink with aluminium packaging.

In contrast thereto, reference numeral 20 in Figs. 1 to 6 denotes a cover body that seals the opening of the ink cartridge main body 1. As shown in Fig. 3, two

rows of longitudinal ribs 21, 21 are formed at an interval so as to project from the inner surface of the cover body 20. The longitudinal ribs 21, 21, which serve to press the foam 18 contained inside the ink cartridge main body 1, are long enough to slide over the cover body 20 in the longitudinal directions to some extent. Further, by making the portions of these ribs 21, 21 that are closer to the ink supply port 10 higher than other portions thereof, the foam 18 on these higher portions is compressed more strongly and the empty pores of the foam 18 are reduced, so that a strong capillary force can be obtained. As a result of such strong capillary force, the ink within the foam 18 is gathered toward the ink supply port 10. Moreover, inside these longitudinal ribs 21, 21, many horizontal ribs 22 are erected so as to be orthogonal to the longitudinal direction and with one ends thereof being distanced from the corresponding longitudinal rib 21 alternately so that a passage is formed zigzag. As a result of this construction, bubbles of ink produced at the time of evacuation can be separated into ink and air during the process of guiding such bubbles to an air release hole 31 via the long passage, and then only air is released outside.

On the other hand, as shown in Fig. 3, several reinforcing ribs 23 are formed so as to project from the longitudinal ribs 21 outside and so as to come in contact with the inner side surface of the opening edge 4 of the ink cartridge main body 1. The reinforcing ribs 23, serving to suppress inward flexion of the opening edge 4, extend so as to be orthogonal to the longitudinal direction. Further, as shown in Fig. 5 in enlarged form, outside of the reinforcing rib 23 forms a welding surface 24 that is to be welded with a welding margin 5 projecting from the top surface of the opening edge 4, and an outer peripheral projecting edge 26 is formed outside of the welding surface 24 through a slender groove 25 that receives burs produced at the time of welding.

On the other hand, as shown in Fig. 4, an ink charging hole 30 and the air release hole 31 are formed so as to pass through the middle portion and a portion of the upper surface of the cover body 20, the portion being close to the ink supply port 10. Further, a snake groove is formed in this upper surface so as to be labyrinth like. The

head end of the snake groove 32 communicates with the air release hole 31 and the tail end thereof forms a through hole portion 33 communicating with a film 35. The snake groove 32 is arranged so as to prevent evaporation of the ink inside the cartridge in using the ink cartridge. That is, when the tail end of the film 35 has been peeled off and the cartridge main body 1 has been opened onto the atmosphere through the snake groove 32, the snake groove 32 that is long prevents the ink from evaporating. Hereupon, the shape of the snake groove 32 is always the same independently of type of the ink cartridge 120, for example, the ink cartridges having different types of cover bodies 20 as shown in Figs. 2(a) and 2(b) and the ink amount which can be charged being different from each other. Therefore, the film 35 having the same width can be used for covering the snake groove 32.

In the thus constructed embodiment, when the cover body 20 is placed on the thick-walled opening edge 4 so as to cover the opening of the cartridge main body 1 and slid along the length (direction of arrow A in Fig. 6; direction of vibration fusing for integrating the cover body 20 and the cartridge main body 1), the opening edge 4 of the cartridge main body 1 allows the projecting welding margin 5 to be welded with the welding surface 24 on the inner surface of the cover body 20 without being deformed while supported by the reinforcing ribs 23 that protect from the outside of the longitudinal ribs 21. At the same time, both the opening edge 4 and the cover body 20 are integrated with each other while leaving a gap δ amounting to some 0.2 mm therebetween and allowing the burs produced during welding to be contained in the slender groove 25 formed in the inner surface of the cover body 20.

Then, an ink having a small surface tension is charged into the main body 1 through the ink charging hole 30 arranged in the cover body 20, and then while evacuating the ink cartridge so as to be kept inclined by about 30° so that the air release hole 31 is positioned at a higher place, the film 35 is bonded onto the upper surface of the cover body 20. As a result, bubbles produced within the foam 18 are separated from the ink while passing through the long zigzag passage formed by the horizontal

ribs 22, and only air flows out to the upper surface of the cover body 20 from the air release hole 31, and further flows out into the through hole portion 33 that is in contact with the film 35 via the snake groove 32.

In contradistinction thereto, Figs. 7 to 10 show a second embodiment of the present invention, which is an ink cartridge adapted for colour printers.

This ink cartridge includes: three ink tanks 41c, 41m, 41y that can contain a cyan ink, a magenta ink, and an yellow ink separately through partitions 43, 43; and a single cover body 50 that covers the upper openings of these ink tanks

Cylindrical ink supply ports 51c, 51m, 51y are formed at one ends of the bottom surfaces 48 of these ink tanks 41c, 41m, 41y so as to project front the bottom surfaces 48.

Further, these ink supply ports 51c, 51m, 51y are connected to one another through ribs 55, 55, and the outer circumferences thereof are surrounded by a common frame 52 that is rectangular as viewed from top.

As a result of this construction, the respective ink supply ports 51c, 51m, 51y can be sealed simultaneously by using a long tape 56. The air entrapped at the time of sealing the ports is driven into an air release portion 53 formed around these ink supply ports and caused to escape from notches 54 formed in the upper edge of the frame 52. Hence, the tape 56 can be bonded reliably.

Reference numeral 65 denotes a common recess arranged on the bottom surfaces 48 of these ink tanks 41c, 41m, 41y so as to extend across these ink tanks, The recess 65 serves not only as a portion to be retained in part of the cartridge holder, but also a portion that prevents the foam 18 from coming in contact, so that the amount of ink that is not absorbed by the foam 18 is reduced and a space for evacuation packaging by aluminium packaging can be provided.

On the other hand, as shown in Fig. 9, several longitudinal ribs 61 .. .. for pressing these foams are arranged so as to project from the inner surface of the cover body 50 in the longitudinal direction for the respective ink tanks 41c, 41m, 41y.

Portions of these ribs 61 .. .. closer to the respective ink supply ports 51c, 51m, 51y are made higher, so that the foams in these portions are pressed and deformed with stronger forces. In addition, two inwardly located longitudinal ribs 61, 61 out of these longitudinal ribs 61 .. .. of each ink tank are brought into contact with a corresponding ink charging sleeve 70, so that a passage 67 formed between the ribs 61 and the ink charging sleeve 70 is closed lest bubbles should flow directly to an air release hole 71 arranged closer to the corresponding ink supply port 51.

It may be noted that reference numeral 74 in Figs. 7 to 10 denotes a shape keeping rib that is formed so as to project outside the outermost longitudinal ribs 61, 61 in a direction orthogonal to the longitudinal direction. By bringing these shape keeping ribs 74 into contact with the opening edges of the ink tanks 41c, 41y on both ends, the outer walls 42 of the cartridge are not deformed inward when the cartridge is subjected to a vibration welding process.

On the other hand, as shown in Fig. 10, snake grooves 72c, 72m, 72y are formed so as to be recessed labyrinth like in the upper surface of the cover body 50, one ends thereof extending to air release holes 71c, 71m, 71y, respectively. Further, the tail ends of the snake grooves 72c, 72m, 72y are led to a single place, and one of air communicating holes 73c, 73m, 73y of these snake grooves, i.e., the air communicating hole 73m arranged on the tail end of the snake groove 72m for magenta in this embodiment, is projected in a film 75 peeling direction, so that the film can be peeled off with ease.

These snake grooves 72 (72c, 72m, 72y) have the same shape independently of the cover bodies 50 of cartridges either being dedicated to monochromatic printing or colour printing or having different ink capacities. As a result, moulding costs can be reduced, and the snake grooves 72 can be covered with films 75 of the same width. Further, considerations are given either to prevent grooves 77 which is a part of grooves 72 from being clogged at a portion 76 at which the films are overlapped with the grooves 77 during a plurality of repeated film welding processes with a heater chip

or to prevent the grooves 77' which is a part of grooves 72 from being clogged by strong contact with the partitions 43 and the outer walls 42 of the ink cartridge at portions 78 in Fig. 10. That is, the snake grooves 72 are designed so that the width and depth of the grooves 77, 77' at the aforementioned portions 76, 78 are made large, i.e., the sectional areas of these portions 76, 78 are made large in order to prevent the clogging of the snake grooves during the welding operation.

While an example in which an ink cartridge is moulded using polypropylene as a material has been described in the aforementioned embodiments, the present invention can be applied also to ink cartridges that are formed using a soft synthetic resin that does not permeate moisture such as high-density polyethylene.

Next, explanations with respect to the loading mechanism for the aforementioned ink cartridge will be provided.

Figs. 11 to 13 show an embodiment of the present invention, which is a loading mechanism that loads an ink cartridge to the carriage of a colour printer.

In Figs. 11 to 13, reference numeral 101 denotes a carriage that serves also as an ink cartridge loading member. The carriage 101 travels in scanning directions while guided by a guide rod 102. The carriage 101 is designed to load two ink cartridges, one for the black ink and the other for the colour inks. A recording head 116 is adjustably attached to the
bottom surface 103 of the cartridge loading section with an ink supply needle 119 projecting inward therefrom, the bottom surface 103 being opposite to an ink cartridge 120 setting opening 104.

The carriage 101 has a guide groove 106 on a side surface of each setting opening 104, the guide groove 106 serving to guide the lower end of a lifter 115 that will be described later. A latch like portion 106a formed on the upper end of the guide groove 106 allows a carriage cover body 110 to be held in an opened position through the lifter 115. A vertical portion 106b formed in the lower half of the guide groove 106 allows the ink cartridge 120 to descend and ascend vertically with respect to the

recording head 118. The vertical portion 106b extends in parallel to the axial centre at the ink supply needle 119.

The carriage cover body 110, which turns about a pivot pin 111, is turnably attached to an upper end portion of the carriage 101 on the guide rod 102 side of the setting opening 104. The carriage cover body 110 is designed to be opened and closed by engaging and disengaging a catching piece 112 with and from a retaining portion 105. The catching piece 112, whose cross section is U-shaped, is formed integrally with the free end portion of the carriage cover body 110, and the retaining portion 105 is formed on the other side of the carriage setting opening 104.

A cantilevered cartridge pressing piece 113 is disposed integrally with the carriage cover body 110. The cartridge pressing piece 113 is formed by cutting the three sides at a portion of the carriage cover body 110 on the pivot pin 111 side away from the carriage cover body 110 while leaving a single side thereof uncut. A free end portion 113a of the cartridge pressing piece 113 that projects downward with the carriage cover body 110 closed is pressed onto the top surface of the ink cartridge 120, so that the ink supply needle 119 on the recording head 118 side can be inserted into an ink supply port 121 arranged on the bottom surface 8 of the cartridge 120.

The base end of the lifter 115 is turnably attached to a portion of the carriage cover body 110, the portion being slightly closer to the free end portion 113a side than the pivot pin 111. Further, a projection 116 that projects from the other end of the lifter 115 is designed to slide along the guide groove 106. With the carriage cover body 110 fully opened, the carriage cover body 110 is retained in such fully opened position by the latch like portion 106a on the upper end of the guide groove 106, whereas with the carriage cover body 110 turned to a position immediately before closing, the ink cartridge on the lifter 115 is allowed to descend vertically down onto the recording head 118 along the vertical portion 106b extending in parallel to the axial centre of the ink supply needle 119.

It may be noted that reference numerals 107, 107 denote angle adjusting levers

that adjust the turning of the colour and black recording heads 118 about not shown pivots and that reference numeral 108 denotes a nozzle position adjusting lever that adjusts the colour recording head in a sheet forward direction with the black recording head 118 as a reference.

When the aforementioned ink cartridge 120 is loaded on the carriage 101, the engaging recess 15 of the ink cartridge main body 1 can be engaged with a support rod 117 formed between the lower ends of the lifters 115, 115 so as to lie across the inside of the ink cartridge main body 1, only by dropping the ink cartridge 120 into the setting opening 104, and the widthwise strength of the ink cartridge 120 can be increased by increasing the modulus of section of the bottom surface 8. Further, as shown in Fig. 14, at the time of vacuum-packaging the ink cartridge 120, a packaging material 126 is spread along with the engaging recess 15 to the limit of elasticity thereof, so that a buffer function can be given, should air enter into the engaging recess 15. That is, the packaging material 126 has such a buffer function as to allow a negative pressure within the engaging recess 15 to be kept by the restitutive force thereof that tends to recover from inside the engaging recess 15 as shown by the two-dot chain line should air enter into the engaging recess 15.

In the thus constructed embodiment, the ink cartridge 120 can be loaded to the carriage 101 in the following way. As shown in Fig. 12 (a), first, the carriage cover body 110 is opened, and the carriage cover body 110 is held in the fully opened position by causing the projection 116 on the lower end of the lifter 115 to be retained in the latch like portion 106a of the guide groove 106. Then, the ink cartridge 120 is dropped into the setting opening 104 of the carriage 101 while positioned in such a manner that the ink supply port 121 confronts the ink supply needle 119.

As a result, as shown in Fig. 12 (b), the engaging recess 15 arranged near the ink supply port 10 engages with the projection 116 of the lifter 115, so that the ink cartridge 120 is held in such a position as to be inclined counterclockwise as viewed in Fig. 12 (b) with a heavier portion thereof that is opposite to the ink supply port 10

positioned downward.

When the carriage cover body 110 is being closed under this condition, the ink cartridge 120 descends while guided by an inner surface 104a of the setting opening 104 closer to the retaining portion 105 as shown in Fig. 12 (c). Then, as the support rod 116 on the lower end of the lifter 115 reaches the vertical portion 106b of the lower half of the guide groove 106 to thereby allow the projection 116 to descend vertically, the ink cartridge 120 gradually changes the position thereof so as to be horizontal with the upper end of the inner surface 104a on the retaining portion 105 side as a fulcrum.

Finally, as the projection 116 on the lower end of the lifter 115 nears the lower end of the guide groove 106, the projection 115 causes the cartridge 120 to descend with the free end portion 113a of the cantilevered cartridge pressing piece 113 arranged on the carriage cover body 110 pressing the top surface of the cartridge 120 from above as shown in Fig. 12 (d), so that the ink supply needle 119 located immediately below the cartridge 120 is allowed to pass through the ink supply port 10 while breaking the film. As a result, the recording head 118 is integrated with the ink cartridge 120 so as to communicate with each other.

On the other hand, if a new ink cartridge 120 must be set in place of the old ink cartridge 120 whose ink has ran out due to recording that lasted for a long period of time, then the catching piece 112 is pressed to get the carriage cover body 110 out of the retaining portion 105.

As a result, the carriage cover body 110 is ejected upward by elasticity of the cartridge pressing piece 113. When the carriage cover body 110 is further opened, the projection 16 that has been guided by the vertical portion 106b of the guide groove 106 raises the ink cartridge 120 right above together with the lifter 115 with the position of the ink cartridge 120 unchanged. Then, the ink supply port 10 in removed from the ink supply needle 119 without damaging the ink supply needle 119. Hence, the ink cartridge 120 is ready to be taken out.

Therefore, the ink cartridge 120 is taken out while pinched with fingers by

causing the ink cartridge 120 to ascend to the setting opening 104 while reversely performing the operations from Figs. 2 (c) to 2 (a).

In contrast thereto, it the ink cartridge 120 is dropped with the side surfaces thereof facing in wrong directions, i.e., in such a position that the ink supply port 10 does not confront the ink supply needle 119, then the ink cartridge 120 is caused to descend with the engaging recess 15 unengaged with the support rod 116 of the lifter 115 as shown in Fig. 13. Therefore, the ink supply port 10 comes in contact with the bottom surface 103 of the carriage 1.

However, since the top surface of the ink cartridge 120 still projects from the setting opening 104 under this condition, not only cannot the carriage cover body 110 be closed any further while disturbed by the projecting top surface of the ink cartridge 120, but also the ink cartridge 120 is not allowed to be pressed, either. Hence, the user is informed of such abnormal loading condition immediately, so that the ink supply needle 119 is prevented from being broken due to the ink cartridge being forced into the carriage.

By the way, the foregoing describes the present invention with reference to an example of an ink cartridge to be loaded to the carriage of a colour printer and an example of a loading mechanism for such ink cartridge. However, it goes without saying that the present invention can be applied not only to monochromatic printers, but also to printers of such type that an ink cartridge is loaded on one side or both sides of the printer main body.

As described in the foregoing, according to the present invention, reinforcing ridges are arranged on the corner portions of peripheral walls of an ink tank, and the opening end edge of the ink tank is thick-walled. Therefore, the ink tank moulded using a resin material that is hard to permeate water vapour but that is soft, is given a sufficient rigidity. In addition, projecting portions that suppress deformation of the opening end edge are arranged outside longitudinally extending foam pressing projecting portions disposed on the inner surface of the cover body. Therefore, the ink

tank is prevented from being deformed at the time of vibration welding, with not much sliding resistance produced at the time of welding the ink tank with the cover body.

Further, a rectangular frame is arranged around a cylindrical ink supply port so as to surround the ink supply port. Therefore, not only the ink supply port can be sealed easily as well as economically using a long film without cutting the corner portions of the film, but also such frame prevents erroneous attachment of the ink tank that is out of specification.

Still further, a passage extending to an air release hole is formed on the inner surface of the cover body so as to maximise the length of the passage. Therefore, even if an ink having a small surface tension that is easy to produce bubbles by evacuation is charged into the tank, the ink can be separated from the gas in the process of causing the ink to flow through the passage, which in turn allows only the gas to be discharged outside effectively and hence prevents contamination of the tank at the time of charging the ink.

Furthermore, a positioning engaging recess engageable with part of a lifter is arranged in the lower surface of a cartridge main body. Therefore, the cartridge main body can be correctly loaded to a predetermined position of a cartridge loading member through the lifter. In addition, even if the wall of the ink cartridge main body is made as thin as possible to maximise the capacity for containing ink, the engaging recess can increase the modulus of widthwise section of the ink cartridge main body, so that strength can be increased accordingly. Furthermore, a portion of the recess that projects inward of the ink cartridge main body decreases the size of the pores of a porous substance in this portion and increases the meniscus of the ink in such pores. Therefore, even if the amount of ink remaining in the porous substance is small, the ink is gathered close to an ink supply port, thus allowing the ink to be used up.

On the other hand, not only a guide portion extending in parallel to the ink supply needle of a recording head is arranged on one side of the cartridge loading member, but also the lifter that supports a portion of the cartridge on the ink supply

port side is made displaceable along with the guide portion through the opening and closing operation of a carriage cover body. Therefore, only by opening and closing the cover body, the ink cartridge that is engageably supported on the lifter can be loaded or unloaded straight along the ink supply needle. As a result, not only the ink supply needle is prevented from being broken, but also if the ink cartridge is inserted with the side surfaces thereof facing in wrong directions, the ink cartridge is not allowed to engage with a support portion, which in turn does not allow the cover body to be opened or closed. Hence, the user can be informed of such abnormal setting condition immediately.

Still further, the ink cartridge is allowed to be loaded and unloaded with a portion of the bottom surface thereof on the ink supply port side, not a side surface thereof, supported. Therefore, the projecting portion from the side surface of the cartridge is dispensed with, so that the capacity for containing ink is increased accordingly and the size of the cartridge loading member, i.e., the width of the carriage is decreased, which in turn contributes to downsizing a printer itself.

The aforegoing description has been given by way of example only and it will be appreciated by a person skilled in the art that modifications can be made without departing from the scope of the present invention.

CLAIMS

1. An ink cartridge comprising:

an ink cartridge main body being moulded using a soft synthetic resin material, and having a reinforcing and positioning ridge being formed so as to project from a corner portion of a peripheral wall of said ink cartridge main body, an opening end edge of said ink cartridge main body being thick-walled; and

a cover body covering an opening of said ink cartridge main body, and said cover body including: a charged foam pressing ridge being formed so as to project from an inner surface of said cover body in a longitudinal direction and to press a foam charged in said ink cartridge main body; and a shape keeping ridge coming in contact with an inner side surface of said opening end edge of said ink cartridge main body and being formed on an outer side of said charged foam pressing ridge, said charged foam pressing ridge being formed integrally with said shape keeping ridge.

2. The ink cartridge according to claim 1, wherein said ink cartridge main body is made of polypropylene.

3. The ink cartridge according to claim 1 or claim 2, wherein a thickness of a peripheral wall surface in a direction orthogonal to a vibrating direction at the time of welding said ink cartridge main body is made larger than a thickness of other peripheral wall surfaces.

4. The ink cartridge according to any preceding claim, wherein at least a single positioning ridge is formed integrally with an outer circumferential surface of an ink supply portion projecting from a bottom surface of said ink cartridge main body, said positioning ridge extending in an ink cartridge main body setting direction.

5. The ink cartridge according to any preceding claim, wherein a rectangular frame is formed integrally around a cylindrical ink supply portion projecting from a bottom surface of said ink cartridge main body so as to surround said ink supply portion.

6. The ink cartridge according to any preceding claim, wherein a plurality of ink supply portions for an ink cartridge for a colour printer are formed so as to project from a bottom surface of said ink cartridge for the colour printer, and are connected to one another with ribs, and a rectangular frame is formed integrally around said ink supply portions so as to surround said respective ink supply portions.

7. The ink cartridge according to claim 5, wherein a notch is formed on an edge of said frame, said notch serving to release air at the time of bonding a film.

8. The ink cartridge according to any preceding claim, wherein a recess is formed in a bottom surface of said ink cartridge main body in proximity with an ink supply portion, said recess extending in a direction orthogonal to a longitudinal direction.

9. The ink cartridge according to any preceding claim, wherein a labyrinth like groove is formed in an upper surface of said cover body, one end of the groove communicating with an air release hole.

10. The ink cartridge according to claim 9, wherein a film is welded using a film welding heater chip multiple times so as to overlap said labyrinth like groove, and a sectional area of a portion of said labyrinth like groove at which the film is welded is made large.

11. The ink cartridge according to claim 9, wherein said labyrinth like groove formed in the upper surface of said cover body is given a common shape for all cover

bodies to be applied to various types of ink cartridge main bodies of which ink capacities are different.

12. The ink cartridge according to claim 9, wherein a plurality of said labyrinth like grooves are formed in the upper surface of said cover body of the ink cartridge for a colour printer, and one of tail end discharge holes of said respective labyrinth like grooves is positioned so as to project from other tail end discharge holes in a film peeling direction, the film serving to cover said cover body.

13. The ink cartridge according to any preceding claim, wherein a plurality of ribs for providing a zigzag passage reaching an air release hole are formed integrally with the inner surface of said cover body.

14. The ink cartridge according to any preceding claim, wherein a rib out of a plurality of ribs formed on the inner surface of said cover body is set to such a height as not to come in contact with said foam, said rib being close to an air release hole.

15. The ink cartridge according to any one of claims 1 to 12, wherein a plurality of ribs are formed integrally with the inner surface of said cover body in a longitudinal direction, said ribs serving to provide a passage reaching an air release hole, and part of said passage formed by said ribs is shut.

16. The ink cartridge according to any preceding claim, wherein a groove is formed around an outer peripheral portion of a vibration welding surface of said cover body, said groove serving to prevent scattering of burs produced at the time of vibration welding.

17. The ink cartridge according to any preceding claim, wherein a gap necessary for

vibration welding is provided between confronting surfaces of said ink cartridge main body and said cover body.

18. An ink cartridge comprising a recess to be coupled with part of a lifter member, said recess and an ink supply port being formed in a lower surface of an ink cartridge main body.

19. The ink cartridge according to claim 18, wherein said recess is formed so as to be long enough to reach both side surfaces of said ink cartridge main body.

20. The ink cartridge according to claim 18 or claim 19, wherein said recess is formed so as to project inward of said ink cartridge main body.

21. A loading mechanism for an ink cartridge comprising;

a cartridge loading member having an ink supply needle communicating with a recording head and projected toward an inner depth thereof;

a guide portion on one side of an inner surface of said cartridge loading member, said guide portion extending in parallel to an axial centre of the ink supply needle;

a cover body being turnably attached to an opening of said cartridge loading member;

a lifter member being supported by a cover body, the lifter member being displaceable with a free end thereto guided by said guide portion, said cover body being turnably attached to an opening of said cartridge loading member; and

a support rod on a free end portion of said lifter member, said support rod supporting the ink cartridge while being engaged with a recess formed in a lower surface of the ink cartridge.

22. The loading mechanism for an ink cartridge according to claim 21, further comprising a pressing portion arranged on an inner surface of said cover body so as to be elastically deformable, said pressing portion pressing an ink supply port toward the ink supply needle while coming in contact with a top surface of said ink cartridge immediately before said cover body closes, the ink supply port being arranged on a lower surface of the ink cartridge.

23. An ink cartridge substantially as shown in or as described with reference to any one of the accompanying figures.

24. A loading mechanism for an ink cartridge, substantially as shown in or as described with reference to any one of the accompanying figures.

The Patent Office

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Claims searched:	1-17,23	**Date of search:**	6 August 1997

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B6F: FLR

Int Cl (Ed.6): B41J: 2/175

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
	NONE	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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